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Occupational Safety and Health

A SUMMARY REPORT ON THE GRAIN DUST MEDICAL SURVEILLANCE PROGRAM FOR CYCLE 1 (1978-1981)

Canada

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GRAIN DUST MEDICAL SURVEILLANCE PROGRAM

FOR CYCLE 1 (1978-1981)

Occupational Safety and Health

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SUMMARY AND HIGHLIGHTS

This report is a descriptive summary of Cycle I of the Grain Dust Medical Surveillance Program (GDMSP) and should not be construed otherwise.

As of September 1981, there were 3 136 primary (or country), 24 terminal, 27 transfer and 33 process grain elevators registered in Canada. At these elevators, 16 000 grain handling and 4 500 office workers were employed.

In all, 7 300 workers representing employees of primary, terminal, transfer, and process elevators participated in the program. A total of 99 physicians and 25 grain companies across Canada were involved in Cycle I.

The medical profile of the workers indicated that those in the western region were younger than those in the eastern region. Of the workers included in the program, slightly more than 30 per cent were reported to be smokers, compared with 32 per cent of the Canadian population as a whole in 1981.

The spirometric measurements included Forced Vital Capacity (FVC), Forced Expiratory Volume in One Second (FEV1), and Forced Expiratory Flow during the middle half of the Forced Vital Capacity (FEF_{25-75}). These parameters were compared with reference values calculated using the prediction models recommended by the American Thoracic Society[1]. The results were compiled into two major categories, one classifying workers by smoking habits and one classifying workers by smoking habits and the number of years of employment in the grain industry.

When workers were grouped by smoking habits only, it was seen that the measured values as a percentage of predicted averages for FVC/FEV1 and FEF_{25-75} were greater than 90 per cent and the value of FEV1/FVC was 78 per cent for all workers. The FEV1/FVC for smokers and ex-smokers was slightly lower than for non-smokers.

In general, the observed measurements for FEV1 and FEF_{25-75} were lower than the predicted values for those workers with more than 20 years experience in the grain industry, regardless of their smoking habits. Results for workers with less than 20 years experience were 88 per cent or more for all measurements, except for the average FEF_{25-75} of smokers with 11 to 20 years experience.

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1. R.O. Crapo, A.H. Morris, and R.M. Gardner. "Reference Spirometric Values Using Techniques and Equipment that Meet ATS Recommendations", in American Review of Respiratory Diseases, 1981, Vol. 123, p. 661.

Based on the criteria for classification of respiratory diseases as defined in Labour Canada's guidelines[2], it was found that 83 per cent of non-smokers, 70 per cent of ex-smokers and 70 per cent of smokers had no respiratory diseases. The incidence of pulmonary diseases, however, appeared to increase with the length of employment in the grain industry. Also it was noted that smokers had the highest incidence of disease for all groups.

Respiratory symptoms were recorded as cough, sputum, wheeze, dyspnea, and multiple symptoms. The survey showed that smokers and ex-smokers suffered from these symptoms more often than non-smokers. Workers with more than 20 years experience in the industry had these symptoms up to three times more often than the other groups examined.

The data obtained on respiratory symptoms indicate large variations from province to province, with Quebec, Nova Scotia and New Brunswick yielding frequencies somewhat higher than the rest.

Respiratory function results had to be considered with some reservation as respiratory function tests involve complex measurements. Any interpretation of these results must be tempered by poor integrity of the input and the potential biases that may have resulted.

In the completion of Cycle I, Labour Canada had to deal with such problems as questionable spirometric measurements, inconsistencies in identifying workers, and confusion in classification of observed respiratory functions. Also, because of apparent problems with the data, results for the province of Alberta were not included in this report.

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2. Guidelines for an Environmental and Medical Surveillance Program in the Grain Industry. File No. 897-7-11, Occupational Safety and Health Branch, Labour Canada, 1978.

CHAPTER I

Introduction to the Surveillance Programs

This chapter provides a brief introduction to the environmental surveillance program and background information on the nature and scope of the medical surveillance program.

Background

As of 1981, there were 3 136 primary, 24 terminal, 27 transfer and 33 process grain elevators registered in Canada. In total, there were 16 000 grain handlers and 4 500 office workers employed at these elevators. Thus, a large number of workers were exposed to grain dust.

The union, government and grain industry had long recognized that exposure to grain dust might pose a health hazard. Consequently in 1976, the National Committee on Grain Dust and Health recommended a provisional maximum grain dust level of 10 mg total dust per cubic metre of air for a normal working day.

During the same year, Labour Canada formulated the national programs for health surveillance and environmental monitoring. The demands for action were strong enough that the programs were implemented in 1978 without awaiting the results of research on a "safe" dust level. However, several comprehensive medical studies are under way in Canada to obtain a better understanding of the health hazards associated with grain dust.

Environmental Surveillance Program

The objective of the Environmental Surveillance Program was to monitor the dust concentrations in workplaces. Dust levels in all terminal, transfer and process grain elevators, and a representative number of primary elevators were measured. The measurements suggested in the program specifications given in 1978, in Labour Canada guidelines, were repeated at regular intervals not exceeding two years.

Medical Surveillance Program

The objective of the Medical Surveillance Program is to monitor the health of workers exposed to grain dust on a continuing basis. The program operates in accordance with the Finn Commission's (October 1976) recommendation which states that:

> A pre-employment medical examination should be required of all workers who may be exposed to grain dust in order to detect existing respiratory diseases or a predisposition to them. Grain workers should be re-examined at regular intervals to determine the incidence or spread of pulmonary or respiratory diseases. (Recommendation 12-13)[3]

The program is a long-term project, consisting of one or more examinations of each employee repeated every three years. So far it has been implemented for all employees in the grain industry who have worked continuously for more than 90 days during a period of one year or intermittently for a total of six months during the course of a three-year period. The program operates without costs to the employee. However, an employee who refuses to be examined is advised of the risk involved in refusing.

Scope and Purpose

The purpose of this report is to review the results of the first cycle of the Medical Surveillance Program.

Information gathered from the physicians' reports on the grain workers served to establish a data base for future reference in the monitoring of the workers' health. This, together with information obtained from other sources (environmental monitoring programs or other research), will bring, if deemed appropriate, a modification either to the permissible dust level or to the Surveillance Program.

Limitations of the Program

Some limitations are inherent to the program. The first of these is the fact that the level of dust to which the worker was exposed at the moment of the spirometric test was not available. The second limitation is that not all the primary elevators were included in the survey.

Assumptions

The terms of the survey are defined in the guidelines, and it is assumed that they were respected. The responsibility for complying with the guidelines rests primarily with the physicians and the industry; nevertheless, Labour Canada followed up questionable spirometric measurements with the physicians and still assumes this follow-up function for the second cycle.

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3. W.D. Finn, Report of the Commission on Health and Safety in Grain Elevators. Labour Canada, 1976, Vol. I, p. 73.

CHAPTER II

Survey and Methods of the Medical Surveillance Program

The medical surveillance program comprised eight major phases:

(1) initial problem statement;
(2) preliminary survey design;
(3) survey pre-test;
(4) final survey design;
(5) field work and sampling of primary elevators;
(6) data processing;
(7) interpretation of the survey results; and
(8) recommendations.

This chapter briefly outlines the first six phases, leaving a discussion of the other two for the following chapters.

Initial Problem Statement

The initial problem statement was developed by members of the National Ad Hoc Committee on Grain Dust and Health at the request of Labour Canada. It is based on the origins, objectives, limitations and assumptions of the study as described in Chapter I. The statement was later refined as a result of discussions held between members of this committee and representatives of Labour Canada who conducted a review and analysis of past research and related literature.

The Survey

In developing the preliminary survey design it was necessary to translate the problem statement into a list of specific topics to be covered by the survey and develop a detailed outline of the proposed plan.

After a description of the purpose of the survey and a conclusion from the major sources of information, the topics to be studied were identified and a list of 22 variables was created (Appendix 3). These variables were categorized into seven classes, namely: employment identification, smoking habit, chest X-ray classification, pulmonary functions results, re-examination recommended or not, physicians' comments, and physicians' information.

The next task was to develop the survey procedures and techniques. A report form (Appendix 4) was designed for this purpose by Health and Welfare Canada in consultation with the members of the National Ad Hoc Committee on Grain Dust and Health. It was printed by Labour Canada and distributed to the employers who supplied the forms to the physicians they designated.

There were three types of medical examinations: pre-employment examination, scheduled examinations, and non-scheduled examinations. The non-scheduled examinations were given to employees who, based on the opinion of the examining physician, would require more frequent examinations.

A comparison was to be made between the current and the previous examinations. In this way, the physicians could determine whether any significant change had occurred, and then record this information on the report to the employer.

Physicians' Reports

The physicians maintain a medical record of all health assessments for each employee subject to medical surveillance. These records are to be maintained for the duration of employment of each worker and, in any case, for at least 20 years.

The spirometric measurements of pulmonary function were conducted with equipment and procedures in accordance with the guidelines designed in 1978 for an environmental and medical surveillance program in the grain industry. If a worker's spirogram was found to be abnormal, further clinical evaluation by a physician qualified to diagnose chest diseases was to be indicated.

The physicians' reports were forwarded to Labour Canada's Senior Medical Consultant, Occupational Safety and Health Branch (OSHB), for data compilation.

CHAPTER III

A Profile of the Survey Population

This chapter provides an outline of some of the basic characteristics of the grain handling workers and their employment. The population studied was assumed to be representative of all grain workers. It is important to note that the frequencies and rates given in this report were based on responses to each item of the survey. Incomplete reports were eliminated before calculations.

The variables analyzed here are: weight, height, sex, age, number of years in the industry, place of employment (company), and type of elevator.

Number of Medical Reports Received by Labour Canada

By the end of Cycle I of the GDMSP, Labour Canada had received a total of 8 961 medical practitioners' reports. The breakdown of the total is as follows:

. Incomplete reports (not analyzed)	972
. Single-examination cases	6 845
. Multi-examination cases	1 144
. Total	8 961

A single-examination case described a situation where a given worker was seen by a company physician only once in the three-year cycle. Similarly, a multiple-examination case described a situation wherein a given worker was seen more than once by a company physician and a report of each of these visits was received by Labour Canada.

A total of 96 physicians and 25 grain companies across Canada participated in Cycle I of GDMSP (see Appendices 5 and 6).

Reports Received by Company, Elevator Type, and Sex

Tables 1, 2, and 3 (see Appendix 1) show the number of reports received by company and region, elevator type and region, and sex, respectively. Table 3 shows that only 56 female workers were surveyed. They were excluded from the analysis because they constituted a relatively small number of office workers who were not directly affected by dust concentrations.

Age

As shown in Table 4, the age distribution indicated that the workers were younger in the western region than in the eastern region. The overall mean age was 35.

This information on age was used to predict the spirometric measurements of the workers using a regression model[4], allowing for a comparison with those obtained during the examinations.

Weight and Height

Weight and height were included in the worker's profile because there had been general agreement among researchers that age, height and sometimes weight were qualified predictors for spirometric measurements. The means for those two variables, by province, are presented in Table 5.

Years of Experience

The number of years of experience was recorded on the physicians' reports and was used to group the workers into different classes for the data presentation. The mean of years of experience is presented, by province, in Table 6.

Smoking Habits

Most researchers agree that chronic obstructive pulmonary disease among grain workers may be chiefly ascribable to smokers and that the combined effect of smoking and exposure to grain dust may be more than simply additive. Therefore, the smoking habits of the workers were recorded.

Health and Welfare Canada reported that, in December 1981, approximately six million Canadians, representing 32.7 per cent of the adult population (aged 15 years and over), were regular cigarette smokers. In addition, occasional smokers represented 3.5 per cent of the same population, and those who smoked pipes and/or cigars accounted for only 2.0 per cent. Hence, 38.2 per cent of the adult Canadian population were smokers.

Of the workers included in the program, 3 660 out of 7 213 (50.2%) were reported as smokers during Cycle I of the survey. Health and Welfare Canada reported that the highest smoking prevalence was found among males in

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4. Crapo et. al., op. cit., p. 659.

mining, construction, transportation, and product fabrication as opposed to those in professional and outdoor occupations. Table 7 gives a comparison between Health and Welfare's findings and those generated by this medical survey.

In terms of regional variations, Nova Scotia and Quebec had the highest proportion, in 1981, of males who regularly smoked. The grain handling workers' smoking patterns observed during the survey cycle agreed with this.

CHAPTER IV

Results of Medical Examinations

This chapter deals with the results of the medical examinations, i.e., chest X-rays, pulmonary function (spirometry), observed respiratory symptoms, and physicians' comments. Thus the material covered responds directly to the questions on the workers' respiratory functions status as Cycle 1 of the medical survey started.

These measurements analyzed are being used as base information and will be compared to the data generated by subsequent cycles of the survey.

The workers were classified into three groups according to the years of experience in the grain industry. Those in group A had 10 years or less, in group B, 11 to 20 years and in group C more than 20 years. Each of these three groups was further subdivided into non-smokers, ex-smokers and smokers.

Table 8 (see Appendix 1) shows the average ages and years of experience by group and smoking habits.

Chest X-rays

As part of the medical examinations, chest X-rays of all workers were taken. The physicians examined them to determine whether they showed any abnormalities and, if so, briefly described those X-rays.

Of the X-rays taken, 640 (11.4%) were classified as abnormal. Many of the abnormalities were described as increased blood vessel patterns, old bone fractures, increased heart sizes, or elevated diaphragms. In 81 instances physicians diagnosed chronic pulmonary diseases, emphysema, and/or bronchitis on the basis of the X-ray. However, the chest X-rays did not provide more insight into the health condition of the grain handlers as a group.

Spirometric Measurements and Respiratory Diseases

The results of the spirometric function tests were in Forced Vital Capacity (FVC), Forced Expiratory Volume in one Second (FEV1), Percentage of Forced Expiratory Volume per Second over Forced Vital Capacity ((FEV1/FVC) X 100), and Forced Expiratory Flow during the middle half of the Forced Vital Capacity (FEF_{25-75}).

Predicted values for these measurements were computed using models suggested by the American Thoracic Society[5]. Age and height were used as parameters.

By grouping workers by smoking habits only (see Table 9), it was seen that the values for FVC, FEV1, and FEF_{25-75} were greater than 90 per cent and the value of FEV1/FVC was 78 per cent, for all workers. The FEV1/FVC for smokers and ex-smokers were slightly lower than those of non-smokers.

Table 10 gives the representative statistics of the actual and predicted values by years of experience and by smoking habits. In general, the observed measurements for FEV1 and FEF_{25-75} were lower than the predicted values for those workers with more than 20 years experience in the grain industry, regardless of their smoking habits. The results for workers with less than 20 years experience were 88 per cent or more for all measurements, except for the average FEF_{25-75} of smokers with 11 to 20 years of experience.

From these spirometric measurements, chronic obstructive and restrictive diseases were identified based on these criteria[6]:

- Restrictive disease: (FVC/predicted FVC) less than .8;
- Obstructive disease: (FEV1/FVC) less than .7.

The number of workers falling into these categories is given in Tables 11 and 12. Table 11 shows that 83.2 per cent of non-smokers and 70.4 per cent of ex-smokers and smokers had no respiratory disease based strictly on the criteria above.

The data presented by the years of experience showed that the frequency of respiratory diseases increased with the length of employment. All three categories of workers showed an increase in respiratory disease between those with 10 years experience or less and those with more than 20 years experience.

Table 13 gives the number of pulmonary diseases by province, and a statistical test for the significant difference of the provincial averages of "absences of respiratory" cases is indicated in Table 14.

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5. Crapo et. al., op. cit., pp. 662-663.

6. Guidelines for an Environmental and Medical Surveillance Program in the Grain Dust Industry, op. cit., Appendix C, p. 4.

Observed Respiratory Symptoms

The observed respiratory symptoms recorded by the examining physicians were cough, sputum, wheeze, and dyspnea. The suggested criteria for recording these symptoms were:

- Cough: cough in the morning or during the day or night for more than three months per year for two years.
- Sputum: phlegm in the morning or during the day or night for more than three months per year for two years.
- Wheeze: chest whistling or wheezing most days or nights.
- Dyspnea: shortness of breath on effort or walking up a slight hill.

The frequencies of these symptoms are presented in Table 15 by smoking habits, in Table 16 by years of experience and smoking habits, and by province in Table 17.

Figure 1 (see Appendix 2) shows the percentage of the absence of respiratory symptoms by the number of years worked, and Figure 2 shows the same by province.

Table 15 shows that ex-smokers and smokers suffered from these symptoms more often than non-smokers (16.5 per cent and 28.3 per cent respectively).

The average rate of respiratory symptoms among smokers was 25 per cent higher than for non-smokers for all "experience groups" (see Table 16), with approximately 40 per cent of respiratory symptoms unknown due to incomplete reports. An increase in these symptoms is depicted in Figure 1, which shows that the percentage of absence of respiratory symptoms decreased as the number of years worked increased. As a group, the incidence of respiratory symptoms increased 33 per cent after 20 years experience.

The data presented by province (see Table 17, and Figure 2), show some variations from province to province, with Quebec yielding the highest frequency.

CHAPTER V

Environmental Surveillance and Workers' Health

Airborne dust concentrations in the workplace were monitored by Labour Canada by taking personal and area dust samples. The sample results were not used to establish a relationship between the medical surveillance program and the dust concentration data for the following reasons:

- The environmental surveillance program was not concurrent with the medical surveillance program.
- To protect the primary elevator operators' confidentiality, it was impossible to reveal the location of the elevator and its ventilation control status.

Ventilation

Regional inspection reports showed that most transfer/terminal elevators and approximately 70 per cent of primary elevators were mechanically ventilated. Primary elevators equipped with ventilation systems had concentrations of grain dust below the regulated level more often than those with no such equipment[7].

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7. Statistical Analysis of Data from Environmental Program in Primary Elevators. File No. 895-7-11/1, Occupational Safety and Health Branch, Labour Canada, 1983.

CHAPTER VI

General Comments

Respiratory function tests are often considered by medical practitioners to be extremely complicated, requiring elaborate and expensive equipment and highly skilled staff to perform them and a respiratory physiologist to interpret the results. In addition, any interpretation must be tempered by such factors as poor response and the potential biases that may have resulted. Nevertheless, the medical survey results suggest that there may be potential health hazard associated with occupational exposure to airborne dust among smokers and those with extensive years of experience in the grain industry.

Using the American Thoracic Society model to define respiratory diseases, the survey results indicate that: among the provinces taking part in the survey, the disease rates were somewhat higher in Nova Scotia, New Brunswick, and Quebec. As mentioned earlier, this report summarizes the survey results but leaves medical evaluations to the professionals.

Upon completion of Cycle I, Labour Canada confronted a number of problems such as the assignment by physicians of more than one identification number to one worker; the assignment of similar employee codes by different physicians or the failure to assign any code; questionable spirometric measurements, and confusion in grading the level of respiratory functions. The association of dust level at the work site with the respiratory measurements was non-specific due to the difficulty in ascertaining long-term dust exposure. In addition, there were further complications due to large day-to-day variations and the seasonal nature of elevator work activities.

APPENDICES

APPENDIX 1 - TABLES

Table 1

Number of Reports by Company and Region

Company Name	Atlantic	St. Lawrence	Great Lakes	Central	Mountain	Total
Alberta Wheat Pool	0	0	0	16	170	186
Bunge	0	230	0	0	0	230
C.N.	0	0	2	0	0	2
Cargill	0	61	6	329	0	396
Goderich Elevators	0	0	94	0	0	94
Great Lakes Elevators	0	0	30	0	0	30
Manitoba Wheat Pool	0	0	12	737	0	749
Maple Leaf Mills	0	0	39	0	0	39
Marathon Realty	42	0	0	0	0	42
National Harbours Board	39	296	83	93	0	511
Pacific Grain Elevators	0	0	0	0	252	252
Parrish & Heimbecker	0	0	0	101	0	101
N. M. Paterson	0	0	0	79	0	79
Pioneer	0	0	0	387	45	432
Élévateur Port-Cartier	0	87	0	0	0	87
Prince Rupert Grain	0	0	0	0	4	4
Richardson	0	0	0	111	0	111
Robin Hood Multifoods	0	0	2	0	0	2
Sarnia Elevators	0	0	66	0	0	66
Saskatchewan Wheat Pool	0	0	0	2 086	146	2 232
Élévateurs de Sorel	0	25	0	0	0	25
Élévateurs de Trois-Rivières	0	56	0	0	0	56
United Cooperatives	0	0	9	0	0	9
United Grain Growers	0	0	7	568	155	730
Total	81	755	350	4 507	772	6 465

Table 2

Number of Reports by Elevator Type and Region

Elevator Type	Atlantic	St. Lawrence	Great Lakes	Central	Mountain
Primary	0	0	5	3 457	3
Terminal-Transfer	81	754	347	1 048	766
Process	0	0	0	1	3

Table 3

Number of Reports by Sex

Sex	Number
F	56
M	6 465

Table 4

Age Distribution, 1981

Age	N.S.	N.B.	Que.	Ont.	Man.	Sask.	B.C.	Total
0-19	0	0	15	112	116	319	50	612
20-29	6	6	91	383	258	1 063	278	2 085
30-39	10	9	113	223	81	362	145	943
40-49	9	8	155	196	59	333	113	873
50-59	12	10	155	258	69	356	122	982
60-69	1	9	37	48	25	103	43	266
70+	0	0	0	0	0	1	1	2
Total	38	42	566	1 220	608	2 537	752	5 763
%	0.66	0.73	9.82	21.21	10.56	44.02	13.07	100.00
Mean	41	45	42	36	30	33	35	35

Table 5

Weight and Height Averages

Provinces	Weight (kg)	Height (cm)
Nova Scotia	82.0	174.9
New Brunswick	78.4	173.9
Quebec	76.8	169.9
Ontario	80.4	173.6
Manitoba	80.8	177.0
Saskatchewan	81.9	174.3
British Columbia	79.6	177.7
Mean	79.9	174.5

Table 6

Years of Experience

Provinces	Years of Experience
Nova Scotia	11.8
New Brunswick	13.2
Quebec	13.7
Ontario	8.9
Manitoba	9.5
Saskatchewan	8.8
British Columbia	5.6
Mean	10.21

Table 7

Smoking Habits

Province	Smokers Health and Welfare	Smokers GDMSP
	%	%
Nova Scotia	-	61.16
New Brunswick	-	57.14
Quebec	46.7	60.33
Ontario	35.0	53.23
Manitoba	-	49.16
Saskatchewan	-	51.34
British Columbia	-	37.55

Table 8

Age and Years of Experience by Group and Smoking Habits

	Non-Smokers	Ex-Smokers	Smokers	All*
	(10 years experience or less)			
Average Age	28.0 (n=1 475)	40.2 (n=1 004)	31.9 (n=2 594)	32.3 (n=5 132)
Average Years of Experience	2.54 (n=733)	4.18 (n=359)	3.27 (n=1 173)	3.16 (n=2 305)
	(11 to 20 years experience)			
Average Age	42.6 (n=92)	46.4 (n=166)	44.2 (n=320)	44.5 (n=584)
Average Years of Experience	15.1 (n=92)	15.5 (n=166)	15.4 (n=320)	15.4 (n=584)
	(more than 20 years experience)			
Average Age	51.5 (n=117)	54.6 (n=263)	52.9 (n=358)	53.3 (n=749)
Average Years of Experience	26.7 (n=117)	27.9 (n=263)	27.3 (n=358)	27.4 (n=749)

*All: Includes unknown smoking status.

Table 9

Descriptive Statistics of Spirometric Measurements by Smoking Habits

	Non-Smokers			Ex-Smokers			Smokers			All		
	M	S	C.V.	M	S	C.V.	M	S	C.V.	M	S	C.V.
FVC	5.24	0.98	18.67	4.94	1.02	20.68	5.01	1.06	21.06	5.05	1.03	20.45
FEV1	4.26	0.88	20.66	3.77	0.93	24.60	3.88	0.95	24.48	3.96	0.95	23.88
FEF_{25-75}	4.41	1.46	33.07	3.65	1.57	42.91	3.80	1.57	41.22	3.93	1.57	39.90
P-FVC	5.20	0.62	11.90	4.86	0.55	11.27	5.03	0.56	11.19	5.04	0.59	11.63
P-FEV1	4.31	0.51	11.80	3.95	0.47	12.00	4.15	0.48	11.68	4.15	0.50	12.15
$P\text{-}FEF_{25-75}$	4.55	0.54	11.89	4.03	0.55	13.74	4.34	0.56	12.89	4.32	0.58	13.44
(FVC/P-FVC) %	100.74	18.33	18.19	101.42	17.38	17.14	99.40	17.15	17.25	100.20	17.50	17.47
(FEV1/P-FEV1) %	98.39	17.85	18.14	94.90	18.52	19.50	93.08	17.84	19.17	94.90	18.11	19.08
$(FEF_{25-75}/P\text{-}FEF_{25-75})$ %	97.04	30.35	31.28	89.40	34.14	38.19	86.48	31.82	36.79	89.90	32.27	35.90
(FEV1/FVC) %	81.37	9.06	11.14	76.32	9.74	12.76	77.50	10.15	13.10	78.30	9.96	12.73

M: Average (mean)
S: Standard Deviation
C.V.: Coefficient of Variation
P-: Predicted
FVC: Forced Vital Capacity (litres)
FEV1: Forced Expiratory Volume in One Second (litres)
FEF_{25-75}: Forced Expiratory Flow during the middle half of the Forced Vital Capacity (litres/sec)

Table 10

Spirometric Measurements by Years of Experience and Smoking Habits

	Non-Smokers			Ex-Smokers			Smokers			All		
	M	S	C.V.	M	S	C.V.	M	S	C.V.	M	S	C.V.
(10 years experience or less)												
FVC	5.34	0.94	17.71	5.07	0.98	19.43	5.18	0.98	19.05	5.21	0.98	18.78
FEVI	4.36	0.83	18.96	3.91	0.91	23.25	4.07	0.88	21.66	4.13	0.89	21.47
FEF_{25-75}	4.56	1.40	30.67	3.93	1.57	40.93	4.06	1.50	37.00	4.16	1.51	36.38
P-FVC	5.27	0.60	11.39	4.96	0.55	11.20	5.14	0.53	10.36	5.14	0.57	11.02
P-FEVI	4.39	0.48	10.96	4.05	0.48	11.95	4.25	0.45	10.57	4.25	0.48	11.26
$P\text{-}FEF_{25-75}$	4.65	0.48	10.38	4.16	0.57	13.70	4.48	0.51	11.32	4.47	0.54	12.06
(FVC/P-FVC) %	101.21	18.35	18.13	102.13	16.26	15.92	100.93	16.35	16.20	101.24	16.88	16.68
(FEVI/P-FEVI) %	99.16	17.16	17.31	96.07	17.38	18.10	95.44	16.80	17.60	96.64	17.06	17.65
$(FEF_{25-75}/P\text{-}FEF_{25-75}$	98.42	29.30	29.77	90.95	33.12	36.42	89.90	30.45	33.88	92.53	30.92	33.42
FEVI/FVC) %	81.98	8.80	10.74	77.10	9.49	12.31	78.69	9.68	12.31	79.34	9.56	12.05
(11 to 20 years experience)												
FVC	4.86	0.84	17.34	4.86	1.01	20.82	4.63	1.05	22.59	4.73	1.01	21.34
FEVI	3.82	0.79	20.82	3.75	0.85	22.60	3.43	0.86	25.00	3.58	0.86	23.97
FEF_{25-75}	3.74	1.62	43.31	3.77	1.53	40.55	3.13	1.48	47.40	3.40	1.55	45.40
P-FVC	4.82	0.48	9.87	4.72	0.49	10.36	4.75	0.51	10.65	4.75	0.49	10.41
P-FEVI	3.94	0.38	9.54	3.83	0.39	10.12	3.87	0.41	10.55	3.87	0.40	10.25
$P\text{-}FEF_{25-75}$	4.05	0.38	9.38	3.89	0.38	9.71	3.97	0.41	10.33	3.96	0.40	10.03
(FVC/P-FVC) %	100.97	16.41	16.26	102.59	17.13	16.70	97.17	17.85	18.37	99.36	17.57	17.69
(FEVI/P-FEVI) %	96.94	18.93	19.53	97.44	18.00	18.46	88.12	17.52	19.89	92.14	18.40	19.97
$(FEF_{25-75}/P\text{-}FEVI)$ %	92.58	39.13	42.26	97.04	36.59	37.71	78.59	38.89	43.12	85.97	36.47	42.42
FEVI/FVC) %	78.29	8.21	10.49	77.21	8.26	10.70	74.32	10.33	13.90	75.73	9.63	12.72

Table 10 (cont'd)

	Non-Smokers			Ex-Smokers			Smokers			All		
	M	S	C.V.	M	S	C.V.	M	S	C.V.	M	S	C.V.
(more than 20 years experience)												
FVC	4.29	0.91	21.13	4.49	1.04	23.08	4.09	0.97	23.81	4.26	1.00	23.56
FEVI	3.28	0.89	27.20	3.26	0.87	26.70	2.91	0.76	26.17	3.09	0.84	27.18
FEF_{25-75}	3.06	1.25	48.85	2.81	1.30	46.43	2.46	1.23	50.10	2.69	1.28	47.52
P-FVC	4.54	0.41	8.97	4.58	0.43	9.37	4.50	0.43	9.50	4.54	0.43	9.39
P-FEVI	3.65	0.30	8.28	3.66	0.32	8.71	3.61	0.31	8.53	3.64	0.31	8.55
$P\text{-}FEF_{25-75}$	3.67	0.26	7.10	3.59	0.26	7.23	3.62	0.24	6.60	3.62	0.25	6.90
(FVC/P-FVC) %	94.66	18.57	19.62	97.96	20.97	21.41	90.69	19.27	21.25	93.74	20.05	21.38
(FEVI/P-FEVI) %	89.84	22.72	25.29	89.03	21.69	24.36	80.45	19.23	23.90	84.91	21.12	24.87
$(FEF_{25-75}/P\text{-}FEF_{25-75})$ %	83.07	32.70	39.37	77.53	34.16	44.06	67.56	32.28	47.78	73.83	33.52	45.40
(FEVI/FVC) %	76.01	10.64	14.00	72.79	10.74	14.76	71.56	10.59	14.81	72.77	10.73	14.74

M: Average (mean)
S: Standard Deviation
C.V.: Coefficient of Variation
P-: Predicted
FVC: Forced Vital Capacity (litres)
FEVI: Forced Expiratory Volume in One Second (litres)
FEF_{25-75}: Forced Expiratory Flow during the middle half of the Forced Vital Capacity (litres/sec)

Table 11

Respiratory Diseases by Smoking Habits

Diseases	N(1 681)	E(1 420)	S(3 259)	A(6 462)
Restrictive	125(7.44%)	101(7.11%)	298(9.14%)	531(8.22%)
Obstructive	134(7.97%)	272(19.15%)	566(17.37%)	989(15.30%)
Both	24(1.43%)	47 (3.31%)	99(3.04%)	170(2.63%)
Sub-Total	283(16.84%)	420(25.58%)	963(29.55%)	1 687(26.11%)
No diseases	1 398(83.16%)	1 000(70.42%)	2 296(70.45%)	4 772(73.85%)

N: Non-smokers
E: Ex-smokers
S: Smokers
A: All

Table 12

Respiratory Diseases by Years of Experience and Smoking Habits

Diseases	(10 years experience or less)				(11 to 20 years experience)				(more than 20 years experience)			
	N	E	S	A	N	E	S	A	N	E	S	A
	n=731	n=359	n=1 172	n=2 304	n=92	n=166	n=320	n=580	n=117	n=263	n=358	n=749
Restrictive	55 (7.52%)	26 (7.24%)	88 (7.51%)	175 (7.60%)	4 (4.35%)	11 (6.62%)	34 (10.63%)	49 (8.39%)	11 (9.40%)	32 (12.17%)	66 (18.44%)	194 (25.90%)
Obstructive	31 (4.24%)	27 (7.52%)	110 (9.39%)	169 (7.34%)	10 (10.87%)	22 (13.25%)	81 (23.30%)	115 (19.69%)	17 (14.53%)	70 (26.62%)	105 (29.33%)	112 (14.95%)
Both	5 (0.68%)	7 (1.95%)	11 (0.94%)	23 (1.00%)	3 (3.26%)	5 (3.01%)	12 (3.75%)	20 (3.42%)	11 (9.40%)	22 (8.37%)	40 (11.17%)	73 (9.75%)
Total	91 (12.45%)	60 (16.71%)	209 (17.83%)	367 (15.93%)	17 (18.48%)	38 (22.89%)	127 (39.69%)	184 (32.19%)	39 (33.33%)	124 (47.15%)	211 (58.94%)	379 (50.60%)
No disease	640 (87.55%)	299 (83.29%)	963 (82.17%)	1 937 (84.07%)	75 (81.52%)	128 (77.11%)	193 (60.31%)	400 (68.49%)	78 (66.67%)	139 (52.85%)	147 (41.06%)	370 (49.40%)

N: Non-smokers
E: Ex-smokers
S: Smokers
A: All

Table 13

Respiratory Diseases by Province

Province	No Diseases	Restrictive	Obstructive	Both	Respiratory Disease Total	Total
N.S.	9(23.08%)	23(58.97%)	3 (7.69%)	4(10.26%)	30(76.92%)	39
N.B.	28(66.67%)	3 (7.14%)	11(26.19%)	0(-)	14(33.33%)	42
Que.	464(61.46%)	119(15.76%)	122(16.16%)	50 (6.62%)	291(38.54%)	755
Ont.	1 079(83.71%)	67 (5.20%)	109 (8.46%)	34 (2.64%)	210(16.29%)	1 289
Man.	525(84.54%)	32 (5.15%)	54 (8.70%)	10 (1.61%)	96(15.46%)	621
Sask.	2 009(68.24%)	227(7.71%)	653(22.18%)	55 (1.87%)	935(31.76%)	2 944
B.C.	658(85.23%)	60 (7.77%)	37 (4.79%)	17 (2.20%)	114(14.77%)	772
Total	4 772(73.85%)	531 (8.22%)	989(15.30%)	170 (2.63%)	1 690(26.15%)	6 462

Table 14

Statistical Test for Significant Difference for an Absence of Respiratory Symptoms for all Provinces

Province 1	Rate of Absence of Respiratory Symptoms (%)	Province 2	Rate of Absence of Respiratory Symptoms (%)	Standard Normal Z Values
Sask.	68.2	N.B.	66.7	0.1692
B.C.	85.2	Man.	84.5	0.3340
Que.	61.5	N.B.	66.7	-0.5500
B.C.	85.2	Ont.	83.7	0.8329
N.B.	66.7	N.S.	23.1	2.2928
Que	61.5	N.S.	23.1	2.3368
Ont.	83.7	N.B.	66.7	2.3794
Man.	84.5	N.B.	66.7	2.4784
B.C.	85.2	N.B.	66.7	2.6453
Sask.	68.2	Que.	61.5	2.7652
Sask.	68.2	N.S.	23.1	2.8940
Ont.	83.7	N.S.	23.1	4.8424
Man.	84.5	N.S.	23.1	4.9164
B.C.	85.2	N.S.	23.1	5.0945
Sask.	68.2	Man.	84.5	-7.3728
Man.	84.5	Que.	61.5	8.1999
B.C.	85.2	Sask.	68.2	8.4662
B.C.	85.2	Que.	61.5	9.0775
Sask.	68.2	Ont.	83.7	-9.3183
Man.	84.5	Que.	61.5	9.3480
Ont.	83.7	Que.	61.5	10.0037

Table 15

Respiratory Symptoms by Smoking Habits

Symptoms	N(1 036)	E(840)	S(2 076)	A(4 007)
Cough	25 (2.41%)	16 (1.90%)	119 (5.73%)	162 (4.04%)
Cough Dyspnea	2 (0.19%)	7 (0.83%)	36 (1.73%)	45 (1.12%)
Cough Sputum	26 (2.51%)	22 (2.62%)	142 (6.84%)	192 (4.79%)
Cough Sputum Dyspnea	11 (1.06%)	9 (1.07%)	81 (3.90%)	102 (2.55%)
Cough Sputum Wheeze	9 (0.87%)	15 (1.79%)	94 (4.53%)	119 (2.97%)
Cough Sputum Wheeze Dyspnea	8 (0.77%)	19 (2.26%)	115 (5.54%)	144 (3.59%)
Cough Wheeze	2 (0.19%)	4 (0.48%)	31 (1.49%)	37 (0.92%)
Cough Wheeze Dyspnea	5 (0.48%)	4 (0.48%)	17 (0.82%)	26 (0.65%)
Dyspnea	23 (2.22%)	77 (9.17%)	76 (3.66%)	179 (4.47%)
Sputum	15 (1.45%)	24 (2.86%)	66 (3.18%)	105 (2.62%)
Sputum Wheeze	5 (0.48%)	9 (1.07%)	18 (0.87%)	32 (0.80%)
Sputum Dyspnea	4 (0.39%)	10 (1.19%)	13 (0.63%)	27 (0.67%)
Sputum Wheeze Dyspnea	2 (0.19%)	11 (1.31%)	13 (0.63%)	26 (0.65%)
Wheeze	30 (2.90%)	27 (3.21%)	85 (4.09%)	145 (3.62%)

Table 15 (cont'd)

Symptoms	N(1 036)	E(840)	S(2 076)	A(4 007)
Wheeze Dyspnea	8 (0.77%)	27 (3.21%)	33 (1.59%)	68 (1.70%)
Total Symptoms	175 (16.90%)	281 (33.45%)	939 (45.23%)	1 409 (35.16%)
No Symptoms	861 (83.11%)	559 (66.55%)	1 137 (54.77%)	2 598 (64.84%)

N: Non-smokers
E: Ex-smokers
S: Smokers
A: All

Table 16

Respiratory Symptoms* vs Experience of Worker in all Types of Elevators (n=4 989)

	10 Years or Less n=2 045				Between 11 and 20 Years n=719				Over 20 Years n=612				Unknown n=1 413			
	N	E	S	A	N	E	S	A	N	E	S	A	N	E	S	A
	n=560	n=193	n=876	n=1 662	n=80	n=120	n=253	n=459	n=97	n=219	n=312	n=634	n=300	n=307	n=635	n=1 252
Cough	10 (1.79)**	0 (-)	43 (4.91)	55 (3.31)	3 (3.75)	3 (2.5)	20 (7.91)	26 (5.66)	2 (2.06)	6 (2.74)	8 (2.56)	16 (2.52)	10 (3.33)	7 (2.28)	48 (7.56)	65 (5.19)
Cough Dyspnea	1 (0.18)	2 (1.04)	6 (0.68)	9 (0.54)	1 (1.25)	1 (0.83)	8 (3.16)	10 (2.18)	0 (-)	1 (0.46)	11 (3.53)	12 (1.89)	0 (-)	3 (0.98)	11 (1.73)	14 (1.12)
Cough Sputum	5 (0.89)	4 (2.07)	48 (5.48)	58 (3.49)	3 (3.75)	0 (-)	19 (7.51)	23 (5.01)	11 (11.34)	7 (3.20)	28 (8.97)	46 (7.26)	7 (2.33)	11 (3.58)	47 (7.40)	65 (5.19)
Cough Sputum Dyspnea	3 (0.54)	0 (-)	15 (1.71)	18 (1.08)	0 (-)	0 (-)	19 (7.51)	19 (4.14)	6 (6.19)	4 (1.83)	25 (8.01)	36 (5.68)	2 (0.67)	5 (1.63)	22 (3.46)	29 (2.32)
Cough Sputum Wheeze	2 (0.36)	1 (0.52)	23 (2.63)	26 (1.56)	0 (-)	0 (-)	11 (4.35)	12 (2.61)	2 (2.06)	7 (3.20)	15 (4.81)	24 (3.79)	5 (1.67)	7 (2.28)	45 (7.09)	57 (4.55)
Cough Sputum Wheeze Dyspnea	1 (0.18)	2 (1.04)	14 (1.60)	17 (1.02)	2 (2.50)	1 (0.83)	17 (6.72)	20 (4.36)	3 (3.09)	8 (3.65)	46 (14.79)	57 (8.99)	2 (0.67)	8 (2.61)	38 (5.98)	50 (3.99)
Cough Wheeze	0 (-)	1 (0.52)	6 (0.68)	7 (0.42)	1 (1.25)	0 (-)	3 (1.19)	4 (0.87)	1 (1.03)	2 (0.91)	2 (0.64)	5 (0.79)	1 (0.33)	0 (-)	20 (3.15)	21 (1.68)
Cough Wheeze Dyspnea	2 (0.36)	0 (-)	3 (0.34)	5 (0.30)	0 (-)	0 (-)	1 (0.40)	1 (0.22)	0 (-)	2 (0.91)	7 (2.24)	9 (1.42)	3 (1.00)	2 (0.65)	6 (0.94)	11 (0.88)
Dyspnea	9 (1.61)	12 (6.22)	16 (1.83)	38 (2.29)	4 (5.0)	15 (12.5)	13 (5.14)	32 (6.97)	5 (5.15)	29 (13.24)	35 (11.22)	71 (11.20)	5 (1.67)	21 (6.84)	12 (18.90)	38 (3.04)
Sputum	9 (1.61)	3 (1.55)	31 (3.54)	43 (2.59)	0 (-)	8 (6.67)	8 (3.16)	16 (3.49)	0 (-)	7 (3.20)	7 (2.24)	14 (2.21)	6 (2.00)	6 (1.95)	20 (3.15)	32 (2.56)

Table 16 (cont'd)

	10 Years or Less n=2 045				Between 11 and 20 Years n=719				Over 20 Years n=612				Unknown n=1 413			
	N	E	S	A	N	E	S	A	N	E	S	A	N	E	S	A
	n=560	n=193	n=876	n=1 662	n=80	n=120	n=253	n=459	n=97	n=219	n=312	n=634	n=300	n=307	n=635	n=1 252
Sputum Wheeze	3 (0.54)	2 (1.04)	6 (0.68)	11 (0.66)	1 (1.25)	0 (-)	6 (2.37)	7 (1.53)	1 (1.03)	6 (2.74)	2 (0.64)	9 (1.42)	0 (-)	1 (0.33)	4 (0.63)	5 (0.40)
Sputum Dyspnea	2 (0.36)	0 (-)	3 (0.34)	5 (0.30)	0 (-)	3 (2.50)	4 (1.58)	7 (1.53)	1 (1.03)	4 (1.83)	4 (1.28)	9 (1.42)	1 (0.33)	3 (0.98)	2 (0.31)	6 (0.48)
Sputum Wheeze Dyspnea	1 (0.18)	0 (-)	1 (0.11)	2 (0.12)	0 (-)	2 (1.67)	2 (0.79)	4 (0.87)	1 (1.03)	4 (1.83)	3 (0.96)	8 (1.26)	0 (-)	5 (1.63)	7 (1.10)	12 (0.96)
Wheeze	9 (1.61)	7 (3.63)	30 (3.42)	48 (2.89)	2 (2.5)	3 (2.50)	15 (5.93)	20 (4.36)	6 (6.19)	5 (2.28)	9 (2.88)	20 (3.15)	13 (4.33)	12 (3.91)	31 (4.88)	57 (4.55)
Wheeze Dyspnea	1 (0.18)	0 (-)	7 (0.80)	8 (0.48)	2 (2.5)	2 (1.67)	4 (1.58)	8 (1.74)	2 (2.06)	8 (3.65)	12 (3.85)	22 (3.47)	3 (1.00)	17 (5.54)	10 (1.57)	30 (2.40)
Total Symptoms	58 (10.36)	34 (17.62)	252 (28.77)	350 (21.06)	19 (23.75)	38 (31.67)	150 (59.29)	209 (45.5.)	41 (42.27)	100 (45.66)	214 (68.59)	358 (56.47)	58 (19.33)	108 (35.18)	323 (50.87)	492 (39.30)
No Symptoms	502 (89.64)	159 (82.39)	624 (71.23)	1.312 (78.94)	61 (76.25)	82 (68.33)	103 (40.71)	250 (54.47)	56 (57.73)	119 (54.34)	98 (31.41)	276 (45.53)	242 (80.67)	199 (64.82)	312 (49.13)	760 (60.70)

*Excluding cases with no responses for smoking history and for symptoms, and cases showing only symptoms with occasional occurrences.

**Figures in parentheses are percentages. They may not total 100% because of rounding.

N: Non-smokers. E: Ex-smokers. S: Smokers. A: All.

Table 17

Respiratory Symptoms* vs Province in all Types of Elevators n=4 989)

	Nova Scotia n=35				New Brunswick n=18				Quebec n=500				Ontario n=505			
	N	E	S	A	N	E	S	A	N	E	S	A	N	E	S	A
	n=5	n=8	n=22	n=35	n=1	n=4	n=13	n=18	n=114	n=83	n=333	n=530	n=126	n=86	n=293	n=505
Cough	0 (-)**	0 (-)	3 (13.64)	3 (8.57)	0 (-)	0 (-)	1 (7.69)	1 (5.56)	1 (0.88)	2 (2.41)	28 (8.41)	31 (5.85)	1 (0.79)	2 (2.33)	16 (5.46)	19 (3.76)
Cough Dyspnea	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	1 (7.69)	1 (5.56)	1 (0.88)	0 (-)	13 (3.90)	14 (2.64)	0 (-)	0 (-)	2 (0.68)	2 (0.40)
Cough Sputum	1 (20.00)	0 (-)	1 (4.55)	2 (5.71)	0 (-)	0 (-)	1 (7.69)	1 (5.56)	7 (6.14)	2 (2.41)	35 (10.51)	44 (8.30)	3 (2.38)	1 (1.16)	12 (4.10)	16 (3.17)
Cough Sputum Dyspnea	0 (-)	0 (-)	1 (4.55)	1 (2.86)	0 (-)	0 (-)	0 (-)	0 (-)	3 (2.63)	0 (-)	25 (7.51)	28 (5.28)	0 (-)	0 (-)	3 (1.02)	3 (0.59)
Cough Sputum Wheeze	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	2 (1.75)	3 (3.61)	16 (4.80)	21 (3.96)	2 (1.59)	1 (1.16)	8 (2.73)	11 (2.18)
Cough Sputum Wheeze Dyspnea	1 (20.00)	0 (-)	0 (-)	1 (2.86)	0 (-)	0 (-)	0 (-)	0 (-)	1 (0.88)	2 (2.41)	32 (9.61)	35 (6.60)	0 (-)	0 (-)	10 (3.41)	10 (1.98)
Cough Wheeze	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	1 (0.88)	2 (2.41)	2 (0.60)	5 (0.94)	0 (-)	0 (-)	7 (2.39)	7 (1.39)
Cough Wheeze Dyspnea	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	1 (7.69)	1 (5.56)	0 (-)	0 (-)	7 (2.10)	7 (1.32)	0 (-)	0 (-)	1 (0.34)	1 (0.20)
Dyspnea	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	7 (6.14)	11 (13.25)	24 (7.21)	42 (7.92)	0 (-)	7 (8.14)	6 (2.05)	13 (2.57)
Sputum	0 (-)	1 (12.50)	2 (9.09)	3 (8.57)	0 (-)	0 (-)	1 (7.69)	1 (5.56)	0 (-)	1 (1.20)	5 (1.50)	6 (1.13)	1 (0.79)	1 (1.16)	10 (3.41)	12 (2.38)

Table 17 (cont'd)

	Nova Scotia n=35				New Brunswick n=18				Quebec n=500				Ontario n=505			
	N	E	S	A	N	E	S	A	N	E	S	A	N	E	S	A
	n=5	n=8	n=22	n=35	n=1	n=4	n=13	n=18	n=114	n=83	n=333	n=530	n=126	n=86	n=293	n=505
Sputum Wheeze	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	1 (0.88)	0 (-)	1 (0.30)	2 (0.38)	0 (-)	1 (1.16)	5 (1.71)	6 (1.19)
Sputum Dyspnea	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	2 (1.75)	0 (-)	0 (-)	2 (0.38)	0 (-)	0 (-)	0 (-)	0 (-)
Sputum Wheeze Dyspnea	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)
Wheeze	0 (-)	0 (-)	1 (4.55)	1 (2.86)	0 (-)	0 (-)	0 (-)	0 (-)	4 (3.51)	0 (-)	6 (1.80)	10 (1.89)	1 (0.79)	1 (1.16)	8 (2.73)	10 (1.98)
Wheeze Dyspnea	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	1 (7.69)	1 (5.56)	2 (1.75)	0 (-)	12 (3.60)	14 (2.64)	0 (-)	1 (1.16)	1 (0.34)	2 (0.40)
No Symptoms	3 (60)	7 (87.5)	14 (63.64)	24 (68.57)	1 (100)	4 (100)	7 (53.85)	12 (66.67)	82 (71.93)	60 (72.29)	127 (38.14)	269 (50.75)	118 (93.65)	71 (82.56)	204 (69.62)	393 (77.82)

Table 17 (cont'd)

	Manitoba n=528				Saskatchewan n=2 542				British Columbia n=20			
	N	E	S	A	N	E	S	A	N	E	S	A
	n=5	n=8	n=22	n=35	n=1	n=4	n=13	n=18	n=114	n=83	n=333	n=530
Cough	3 (1.78)	2 (2.00)	17 (6.56)	22 (4.17)	24 (3.79)	15 (2.50)	107 (8.17)	146 (5.74)	0 (-)	0 (-)	0 (-)	0 (-)
Cough Dyspnea	1 (0.59)	0 (-)	2 (0.77)	3 (0.57)	1 (0.16)	8 (1.33)	22 (1.68)	31 (1.22)	0 (-)	0 (-)	1 (25.00)	1 (5.00)
Cough Sputum	2 (1.18)	1 (1.00)	16 (6.18)	19 (3.60)	18 (2.84)	25 (4.17)	112 (8.56)	155 (6.10)	0 (-)	0 (-)	0 (-)	0 (-)
Cough Sputum Dyspnea	3 (1.78)	1 (1.00)	12 (4.63)	16 (3.03)	8 (1.26)	12 (2.00)	49 (3.74)	69 (2.71)	0 (-)	0 (-)	0 (-)	0 (-)
Cough Sputum Wheeze	0 (-)	1 (1.00)	9 (3.47)	10 (1.89)	7 (1.11)	10 (1.67)	67 (5.12)	84 (3.30)	0 (-)	0 (-)	0 (-)	0 (-)
Cough Sputum Wheeze Dyspnea	2 (1.18)	2 (2.00)	10 (3.86)	14 (2.65)	4 (0.63)	15 (2.50)	64 (4.89)	83 (3.27)	0 (-)	0 (-)	0 (-)	0 (-)
Cough Wheeze	1 (0.59)	0 (-)	3 (1.16)	4 (0.76)	2 (0.32)	2 (0.33)	25 (1.91)	29 (1.14)	0 (-)	0 (-)	0 (-)	0 (-)
Cough Wheeze Dyspnea	0 (-)	0 (-)	1 (0.39)	1 (0.19)	5 (0.79)	4 (0.67)	8 (0.61)	17 (0.67)	0 (-)	0 (-)	0 (-)	0 (-)
Dyspnea	4 (2.37)	14 (14.00)	12 (4.63)	30 (5.68)	13 (2.05)	53 (8.83)	44 (3.36)	110 (4.33)	0 (-)	0 (-)	0 (-)	0 (-)
Sputum	2 (1.18)	6 (6.00)	11 (4.25)	19 (3.60)	16 (2.53)	24 (4.00)	50 (3.82)	90 (3.54)	0 (-)	0 (-)	0 (-)	0 (-)

Table 17 (cont'd)

	Manitoba n=528				Saskatchewan n=2 542				British Columbia n=20			
	N	E	S	A	N	E	S	A	N	E	S	A
	n=5	n=8	n=22	n=35	n=1	n=4	n=13	n=18	n=114	n=83	n=333	n=530
Sputum Wheeze	3 (1.78)	1 (1.00)	2 (0.77)	6 (1.14)	1 (0.16)	9 (1.50)	16 (1.22)	26 (1.02)	0 (-)	0 (-)	0 (-)	0 (-)
Sputum Dyspnea	1 (0.59)	2 (2.00)	5 (1.93)	8 (1.52)	2 (0.32)	11 (1.83)	10 (0.76)	23 (0.90)	0 (-)	0 (-)	0 (-)	0 (-)
Sputum Wheeze Syspnea	0 (-)	1 (1.00)	3 (1.16)	4 (0.76)	2 (0.32)	11 (1.83)	10 (0.76)	23 (0.90)	0 (-)	0 (-)	0 (-)	0 (-)
Wheeze	5 (2.96)	2 (2.00)	6 (2.32)	13 (2.46)	23 (3.63)	26 (4.33)	70 (5.35)	119 (4.68)	0 (-)	0 (-)	0 (-)	0 (-)
Wheeze Dyspnea	0 (-)	2 (2.00)	4 (1.54)	6 (1.14)	7 (1.11)	24 (4.00)	17 (1.30)	48 (1.89)	0 (-)	0 (-)	0 (-)	0 (-)
No Symptoms	142 (84.02)	65 (65.00)	146 (56.37)	353 (66.86)	500 (78.99)	351 (58.50)	638 (48.74)	1 489 (58.58)	15 (100)	1 (100)	3 (75.00)	19 (95.00)

*Excluding cases with no responses for smoking history and for symptoms, and cases showing only symptoms with occasional occurrences.

**Figures in parentheses are percentages. They may not total 100% because of rounding.

N: Non-smokers. E: Ex-smokers. S: Smokers. A: All.

APPENDIX 2 - FIGURES

Figure 1

Absence of Respiratory Symptoms vs Number of Years Worked

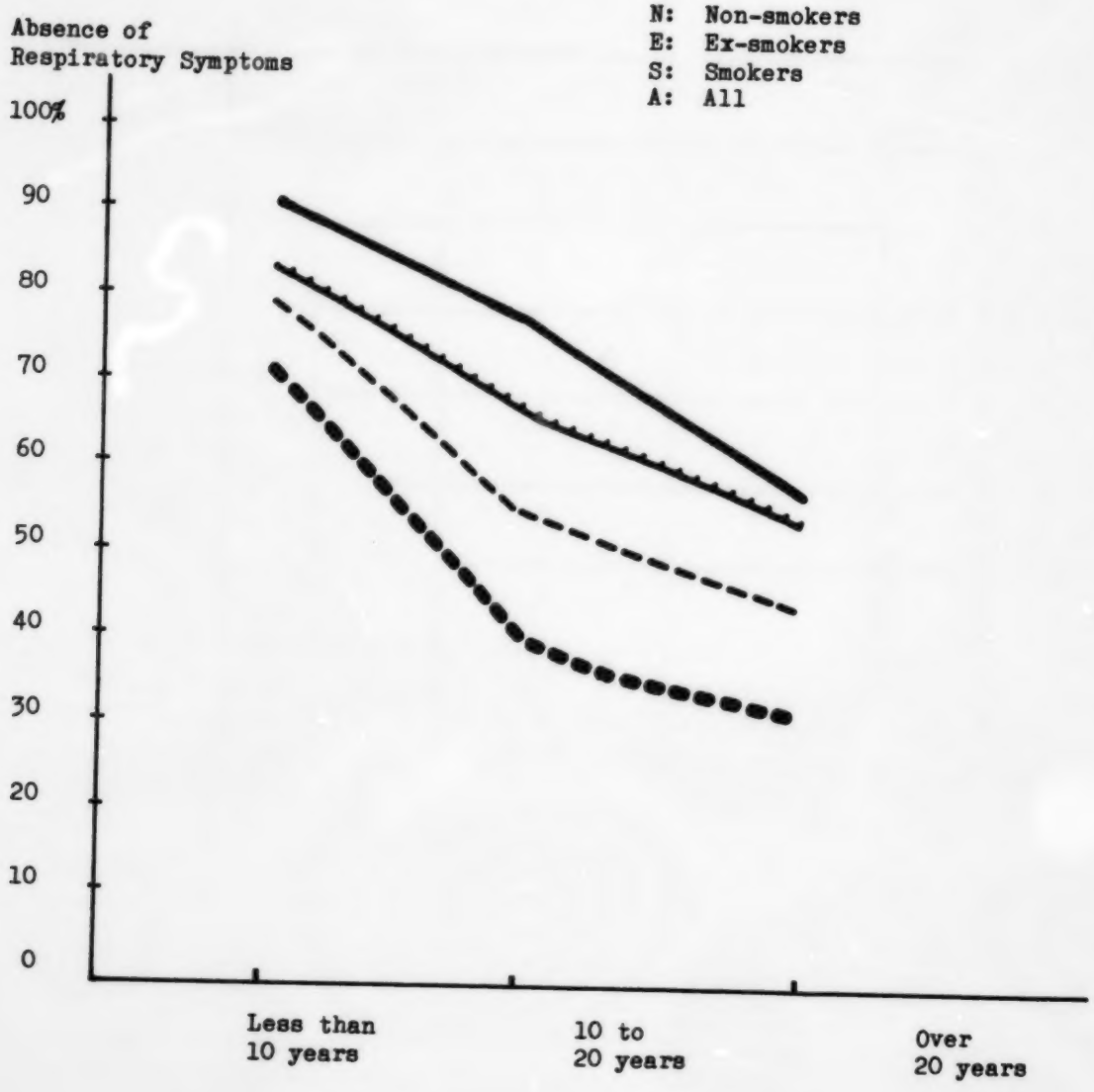


Figure 2

Absence of Respiratory Symptoms by Province

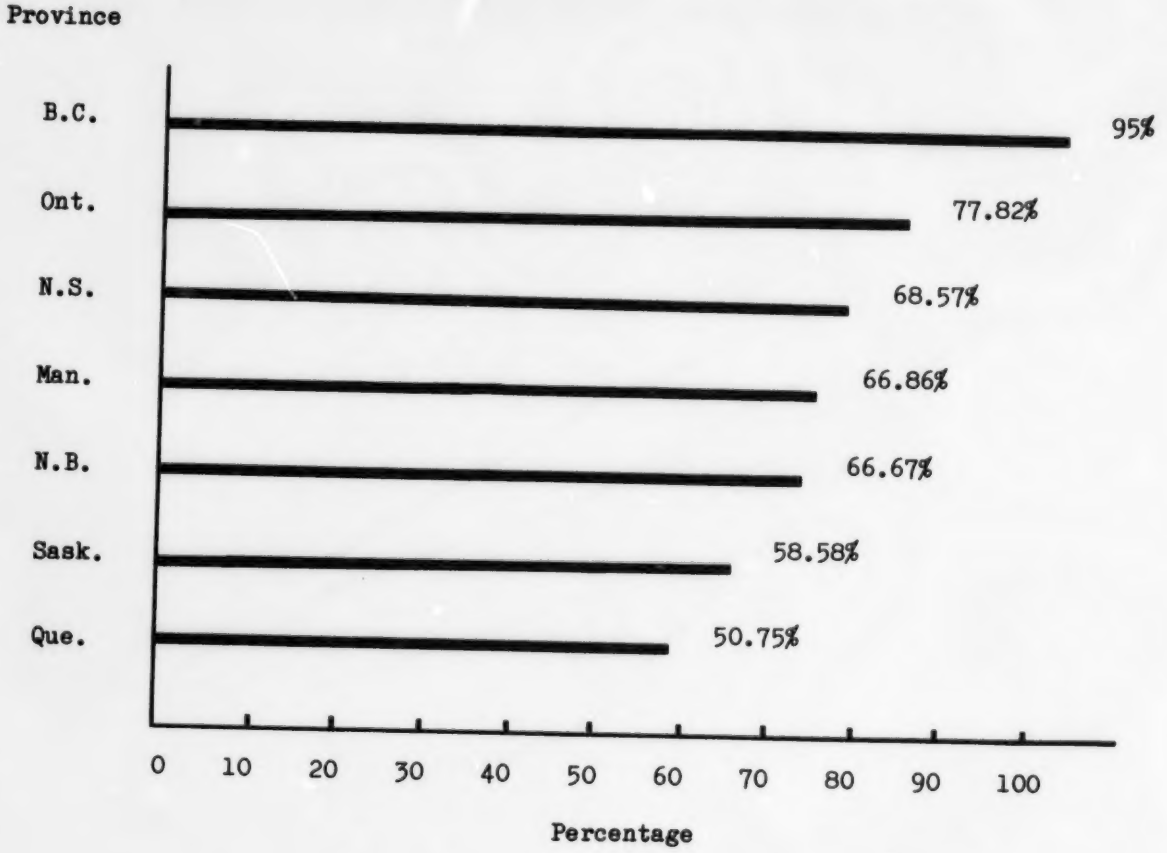
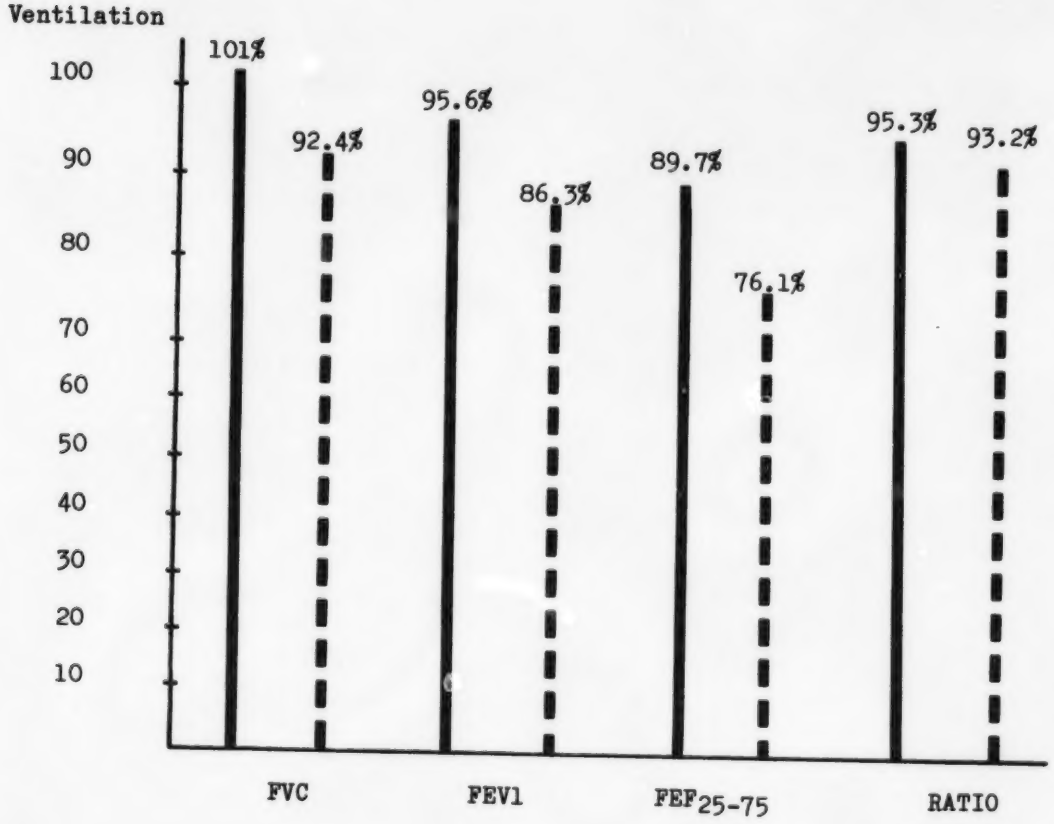


Figure 3

Ventilated vs Non-Ventilated for Spirometry



Ventilated (n=3 623)
Non-ventilated (n=571)

FVC: Forced vital capacity
VEMS: Forced expiratory volume in one second
FEF_{25-75}: Forced Expiratory Flow during the middle half of the Forced Vital Capacity
RATIO: FEV1/FVC.

APPENDIX 3

Questionnaire Items

A - Employment identification

1 - Sex
2 - Age
3 - Number of years in industry
4 - Company name
5 - Elevator name and/or location
6 - Job title
7 - Elevator work area

B - Smoking habit

8 - Smoking habit

C - Chest X-ray classification

9 - Chest X-ray

D - Pulmonary

10 - FVC
11 - FEV1
12 - FEV1/FVC X 100
13 - MMEF
14 - Height
15 - Weight
16 - Cough
17 - Sputum
18 - Wheeze
19 - Dyspnea

E - Recommendation for re-examination

20 - Re-examination

F - Physician's comments

21 - Comments

G - Physician identification

22 - Identification

APPENDIX 4

Medical Practitioner's Report to Labour Canada (Modified)

TO: SENIOR CONSULTANT, OCCUPATIONAL MEDICINE
OCCUPATIONAL SAFETY AND HEALTH BRANCH
LABOUR CANADA, OTTAWA, ONTARIO K1A 0J2

NOTE SHADED AREAS ARE FOR LABOUR CANADA USE ONLY

R ☐ P ☐

1. IDENTIFICATION

EMPLOYEE CODE NO	MALE	FEMALE	AGE	NO OF YEARS IN GRAIN INDUSTRY

COMPANY

TYPE OF ELEVATOR ☐ PRIMARY (COUNTRY) ☐ TERMINAL /TRANSFER ☐ PROCESS

ELEVATOR NAME/LOCATION (EXCEPT PRIMARY)

JOB TITLE

ELEVATOR WORK AREA (EXCEPT PRIMARY)

EXAMINATION ☐ PREPLACEMENT ☐ SPECIAL (SPECIFY) _____ PERIODIC ☐ 1st ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th

DATE OF EXAMINATION

GDC ☐

2. SMOKING ☐ NON-SMOKER

SMOKED PREVIOUSLY ___ YEARS. DATE STOPPED _____

NO. OF CIGARETTES DAILY _____

NO. OF CIGARS DAILY _____

NO. OF PIPEFULLS DAILY _____

SMOKER FOR ___ YEARS

NO OF CIGARETTES DAILY _____

NO OF CIGARS DAILY _____

NO OF PIPEFULLS DAILY _____

P1 ☐ P2 ☐

3. CHEST X-RAY RESULTS

☐ NORMAL ☐ ABNORMAL — BRIEF DESCRIPTION _____

4. PULMONARY FUNCTION RESULTS

FVC (LITRES)	FEV_1 (LITRES)	$\frac{FEV_1}{FVC}$ X 100	MMEF (LITRES/SEC)

HEIGHT _____ cm

WEIGHT _____ kg

5. CLASSIFICATION OF OBSERVED RESPIRATORY FUNCTION (SEE REVERSE SIDE OF FORM FOR GUIDELINES)

	YES	NO
CHRONIC COUGH	☐	☐
CHRONIC SPUTUM	☐	☐
WHEEZE	☐	☐
DYSPNEA ON EFFORT	☐	☐

☐ GRADE 1 ☐ GRADE 2 ☐ GRADE 3

GRADE CHANGED SINCE PREVIOUS EXAMINATION ☐ YES ☐ NO

6. RE-EXAMINATION RECOMMENDED ☐ NO ☐ YES ON _____ DATE

7. COMMENTS _____

MEDICAL PRACTITIONER (NAME — PLEASE PRINT)	(ADDRESS — PLEASE PRINT)
SIGNATURE	TELEPHONE

W ☐ X ☐ Y ☐ Z ☐

Lab/Trav 587 (12/79)

APPENDIX 5

Companies Participating in Cycle 1

Alberta Terminals
Alberta Wheat Pool
Bunge of Canada
C.N.
Cargill
Goderich Elevators
Great Lakes Elevators
Manitoba Pool
Maple Leaf Mills
Marathon Realty
National Harbours Board (now Ports Canada)
Pacific Elevators
Parrish & Heimbecker
N. M. Paterson
Pioneer
Élévateurs de Port-Cartier
Prince Rupert
Richardson
Robin Hood Multifoods
Sarnia Elevators
Saskatchewan Wheat Pool
Élévateurs de Sorel
Élévateurs de Trois-Rivières
United Cooperatives
United Grain Growers

APPENDIX 6

Physicians Participating in Cycle 1

M. Adams - Thunder Bay, Ontario
J. Aggarwal - Lloydminster, Saskatchewan
R. Allat - Hamilton, Ontario
R. Almond - Thunder Bay, Ontario
L. Archambault - Montréal, Québec
G. Barnett - Fort San, Saskatchewan
T. Barrie - Port Colborne, Ontario
E. Bastarache - Sorel, Québec
B. Bélanger - Hauterive, Québec
G. Bhatt - Prescott, Ontario
G. Bretcher - Dauphin, Manitoba
O. Brookes - Medicine Hat, Alberta
B. Brouillette - Sillery, Québec
J. Carson - Churchill, Manitoba
R. Chadwick - Red Deer, Alberta
W. Chisholm - Calgary, Alberta
S. Clarke - Vancouver, British Columbia
D. Cockcroft - Saskatoon, Saskatchewan
A. Collins - Grande Prairie, Alberta
D. Cotton - Saskatoon, Saskatchewan
T. Couillard - Edmonton, Alberta
C. Craig - Red Deer, Alberta
F. Dallison - Calgary, Alberta
J. Dosman - Saskatoon, Saskatchewan
D. Duval - Churchill, Manitoba
A. Ernst - Rosetown, Saskatchewan
R. Ewart - Port Colborne, Ontario
N. Ficzycz - Regina, Saskatchewan
G. Giasson - Montréal, Québec
J. Golumbia - Saskatoon, Saskatchewan
P. Gooch - Prince Rupert, British Columbia
P. Gosselin - Montréal, Québec
J. Greaves - Churchill, Manitoba
S. Grzybowski - Vancouver, British Columbia
J. Haberman - Lethbridge, Alberta
A. Henderson - Winnipeg, Manitoba
W. Ho - Windsor, Ontario
Hoeppner - Saskatoon, Saskatchewan
J. Hupsner - Red Deer, Alberta
R. Jacob - Trois Rivières, Québec
D. Junek - Yorkton, Saskatchewan
N. Kurpa - Thunder Bay, Ontario

P. Labreque - Montréal, Québec
J. Laking - Lloydminster, Saskatchewan
R. Lalande - Port-Cartier, Québec
E. Lembke - Churchill, Manitoba
Lipsett - North Battleford, Saskatchewan
A. MacDonald - Vancouver, British Columbia
A. McInnes - Medicine Hat, Alberta
E. McChuck - Thunder Bay, Ontario
R. Marsden - Owen Sound, Ontario
G. McAllister - Red Deer, Alberta
H. McKenzie - Red Deer, Alberta
D. McKerrell - Swift Current, Saskatchewan
N. McLeod - Thunder Bay, Ontario
McQueen-Smith - Churchill, Manitoba
J. Menzies - Mordern, Manitoba
J. Mells - North Battleford, Saskatchewan
R. Moulson - Thunder Bay, Ontario
M. Mymko - Thunder Bay, Ontario
G. Nicholls - Toronto, Ontario
P. Orr - Churchill, Manitoba
B. Parrington - Red Deed, Alberta
L. Patterson - Vancouver, British Columbia
S. Payten - Prince Rupert, British Columbia
M. Pigeon - Montréal, Québec
A. Povah - Brandon, Manitoba
R. Pritchard - Sarnia, Ontario
O. Rasmussen - Regina, Saskatchewan
C. Richard - Vancouver, British Columbia
P. Rivard - Montréal, Québec
P. Rondeau - Vancouver, British Columbia
D. Rubin - Vancouver, British Columbia
G. Rungi - Port Colborne, Ontario
G. Sas - London, Ontario
A. Sasson - Windsor, Ontario
M. Sayeed - Lloydminster, Saskatchewan
D. Scruton - Prince Rupert, British Columbia
R. Sinclair - Halifax, Nova Scotia
E. Skinner - Medicine Hat, Alberta
T. Smellie - Prescott, Ontario
W. Squires - Weyburn, Saskatchewan
D. Stefiuk - Saskatoon, Saskatchewan
L. Stephen - Dauphin, Manitoba
I. Thom - Regina, Saskatchewan
B. Thomas - Port Colborne, Ontario
G. Thornhill - Saint John, New Brunswick
B. Troffe - Vancouver, British Columbia
A. Trudel - Vancouver, British Columbia
R. Twanow - Melfort, Saskatchewan
J. Twiss - Medicine Hat, Alberta
W. Watters - Goderich, Ontario

F. Waugh - Winnipeg, Manitoba
A. Williams - Lethbridge, Alberta
J. Wilson - Port Colborne, Ontario
B. Woolley - Toronto, Ontario